NON-PUBLIC?: N
ACCESSION #: 9206150002
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Browns Ferry Nuclear Plant (BFN) Unit 2 PAGE: 1 OF 07

DOCKET NUMBER: 05000260

TITLE: Automatic Reactor Scram on Low Reactor Water Level Due to Failure of the Feedwater Level Control System.
EVENT DATE: 04/27/92 LER #: 92-004-01 REPORT DATE: 06/08/92

OTHER FACILITIES INVOLVED: Browns Ferry Unit 1 DOCKET NO: 05000259
Browns Ferry Unit 3 05000296

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Clare S. Hsieh, Compliance Licensing Engineer TELEPHONE: (205) 729-2635

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JK COMPONENT: CAP MANUFACTURER: G080
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On April 27, 1992, at approximately 1432 hours, Unit 2 reactor scrammed on low reactor water level. Engineered safety feature actuations included primary containment isolation system Groups 2, 3, 6, and 8, and actuation of the control room emergency ventilation and standby gas treatment (all trains) as expected.

The low reactor water level was due to the failure of the feedwater level control system. This resulted in the feedwater pumps run back and low flow to the reactor vessel. The operator was unable to regain control of the feed pumps before the reactor scrammed on low water level.

The cause of this event was the master feedwater level controller output failed downscale. The downscale failure was due to an unexpected and

random failure of an electrolytic capacitor in the controller.

The following corrective actions have been or will be taken to address this event: 1) The maintenance planning guide has been revised to include testing wet type electrolytic capacitors, 2) TVA will evaluate the power stores procedure on monitoring shelf life of high-risk components in storage, and 3) TVA will evaluate implementation of the Scram Frequency Reduction Committee recommendation to design and install a fault tolerant digital feedwater control system.

END OF ABSTRACT

I. PLANT CONDITIONS

Unit 2 was operating in the rim mode at approximately 100 percent power (3288 MW Thermal). The Feedwater Level Control (FWLC) system was in automatic three-element control and was controlling reactor vessel water level at approximately +33 inches.

Units 1 and 3 were shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On April 27, 1992, at approximately 1432 hours 21 seconds, the Unit 2 reactor scrammed on low reactor water level (+11 inches), resulting in the actuations of the engineered safety feature (ESF) JE! systems. The ESF actuations included Primary Containment Isolation System (PCIS) JM! Groups 2, 3, 6, and 8 on low water level, and actuation of the Control Room Emergency Ventilation VI! and Standby Gas Treatment BH! systems (all trains) as expected.

The low reactor water level was due to the failure of the FWLC system. (The level controller output signal dropped from 100 percent to 20 percent.) This failure in turn caused all three feedwater pumps to run back to a low flow condition which resulted in a reduced makeup feedwater flow to the reactor vessel. The reactor water level dropped rapidly as flow was reduced, resulting in a recirculation runback initiated by water level below 27 inches and a feedwater low flow condition.

The lead Unit Operator (UO) (utility, licensed), noting the

Reactor Feed Pump Turbine (RFPT) A, B, and C abnormal alarms and the decreasing water level, placed the master feedwater level controller into the manual mode to increase the flow demand signal. However, the operator was unable to regain control of the feed pumps before the reactor tripped on low reactor water level. A manual scram signal was immediately inserted into the Reactor Protection System (RPS) JC!.

At approximately 1432 hours 35 seconds, the reactor water level stabilized at -8.5 inches and started to increase. Eighteen seconds later the level had increased above +11 inches. During this time, both condensate booster pump 2A and RFP 2A tripped on low net positive suction head. The remaining feedwater pumps and the main turbine tripped on high reactor water level (+54 inches), and a manual turbine trip was initiated almost simultaneously with the high reactor level trip signal. All turbines tripped as expected, and all heater strings (high pressure and low pressure) isolated during the water level transient. (The A string heaters were later returned to service.) After all feedwater pumps had tripped, their individual controllers were moved to the manual position.

At approximately 1435 hours, the reactor scram was reset and the control rods were verified to be fully inserted. At 1436 hours, the PCIS was reset and RFP 2C was returned to service to control reactor water level. The reactor was brought to a shutdown condition in accordance with TVA's emergency operating instruction and maintained in a hot condition per normal operating procedures.

As a result of the ESF actuations, including the automatic actuation of the RPS, TVA reports this event in accordance with 10 CFR 50.73(a)(2)(iv) as an event or condition that resulted in manual or automatic actuation of any ESF.

B. Inoperable Structures, Components, or Systems that contributed to the Event:

The master controller output in the FWLC system failed downscale. Troubleshooting the controller circuitry, TVA found a failed electrolytic capacitor (General Electric; C-29, 250 microfarad, Part No. 2098K42-002).

C. Dates and Approximate Times of Major Occurrences:

April 27, 1992 at 1432 hours Reactor scram on low water
21 seconds level (+11 inches)

1432 hours Reactor water level
35 seconds stabilized (-8.5 inches)

1432 hours Reactor water level
53 seconds increased above low level
trip (+11 inches)

1433 hours Main turbine trip on high
reactor water level
(+54 inches)

1435 hours Reset reactor scram

1436 hours RFP 2C returned to control
reactor water level and
reset PCIS

1745 hours Four-hour non-emergency
report to NRC as required by
10 CFR
0.72(b)(2)(ii)

D. Other Systems or Secondary Functions Affected:

None

E. Method of Discovery:

This event was immediately known to the UO upon receiving indications of the reactor scram and the ESF actuations.

F. Operator Actions:

Operations personnel promptly responded to the scram and immediately proceeded to stabilize reactor water level transient.

G. Safety System Responses:

ESF actuations occurred as designed on low reactor water level scram. These actuations included PCIS isolation in Group 2 (residual heat removal), Group 3 (reactor water cleanup) Group 6 (reactor building ventilation and primary containment purge and venting), and Group 8 (reactor low level). Control room emergency ventilation and standby gas treatment Trains A, B, and C started as expected.

III. CAUSE OF THE EVENT

A. Immediate Cause:

The immediate cause of the scram was reactor water level decreasing below the low level setpoint (+11 inches).

B. Root Cause:

The cause of this event was the master feedwater level controller output failed downscale (i.e., controller can only provide 20 percent output signal irrespective of the input signal demand). The downscale failure was due to an unexpected and random failure of an electrolytic capacitor in the controller.

C. Contributing Factors:

None

IV. SAFETY ANALYSIS

Loss of feedwater flow due to feedwater control system failures (or feedwater pump trips) is evaluated in the final safety analysis report as an abnormal operational transient.

The ESF actuations and safety systems functioned as design during the scram. Plant safety was not adversely affected and the safety of plant personnel and the public was not compromised.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

1. The reactor was placed in a stable condition with the

reactor pressure being maintained at 920 psig by the electro-hydraulic control system on turbine bypass valves.

Excessive steam loads were transferred to the auxiliary boilers.

2. RFP 2C was returned to service to control reactor water level and maintain the water level in the vessel in the normal range.

B. Corrective Actions to Prevent Recurrence:

1. TVA has revised the maintenance planning guide to include testing the wet type electrolytic capacitor.

2. TVA will evaluate the power stores procedure on monitoring shelf life of high-risk components.

3. TVA will evaluate implementation of the scram frequency reduction committee recommendation to design and install a fault tolerant digital feedwater control system.

VI. ADDITIONAL INFORMATION

A. Failed Components:

The failed electrolytic capacitor in the master controller was found leaking.

B. Previous LER on Similar Events:

An automatic reactor scram due to a problem with the master level controller occurred on Unit 1 in 1985 (LER 259/85016). Although one electrolytic capacitor was later identified to be out of tolerance and leaking, it was not believed to be the problem that caused the reactor trip. The scram was found to be caused by a cold solder joint in the controller.

VII. Commitments

1. TVA will evaluate the power stores procedure on monitoring shelf life on high-risk components by July 21, 1992.

2. TVA will evaluate implementation of the scram frequency

reduction committee recommendation to design and install a fault tolerant digital feedwater control system by the beginning of Unit 2, Cycle 7 outage.

Energy Industry Identification System (EIIS) codes are identified in the text as XX!.

TVA
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O. J. "Ike" Zeringue
Vice President, Browns Ferry Operations

JUN 08 1992

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Dear Sir:

TVA - BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2 - DOCKET NO. 50-260 - FACILITY OPERATING LICENSE DPR-52 - LICENSEE EVENT REPORT LER-50-260/92004, REVISION 1

Enclosed is Revision 1 to LER 260/92004 submitted on May 26, 1992, concerning the Unit 2 reactor scram on low reactor water level that occurred on April 27, 1992. The Unit 2 reactor scram caused actuation of the control room emergency ventilation and standby gas treatment on all trains. This revision provides additions of Unit 1 and Unit 3 as the other facilities involved in Item 8 of the LER Form 366. Additionally, the requirement for the four-hour, nonemergency report to NRC was changed to 10 CFR 50.72(b)(2)(ii).

Sincerely,

O. J. Zeringue

Enclosure
cc: see page 2

U.S. Nuclear Regulatory Commission

JUN 08 1992

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